Literature Review on Building Energy Modeling for Energy Model of LB365

MEE 612 Activity

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ABSTRACT

This is a review of existing literatures to have a grasp on the basics of energy modeling that will then be used in modeling LB 365 of Bunzel Building of the University of San Carlos – Talamban Campus, this energy model could later be improved and be utilized as a baseline data for comparison if retrofits for energy savings are applied to the said room. Since this aims to model an existing building (data-driven model), it is found in the literature that among the most common simulation programs EnergyPlus and eQUEST (DOE-2 engine), it is more likely for assurance to use EnergyPlus since EnergyPlus supports modeling of an intricate system where there are more inputs. Added to that, it was found in the referred studies that modeling in EnergyPlus needs the following parameters for accurate results: Building Site Information and Weather Data, Building Shell, Structure, Materials, and Shades, Building Operations and Scheduling, Internal Loads, HVAC Equipment and Performance, and HVAC Zoning.

I. INTRODUCTION

Adequate and harmless energy in the future for the world's exponentially growing population is undeniably one of the world's biggest problems, even the linearly progressing field of renewable energy sources may not be enough if there will be a continuous excess in the use of energy.

According to an engineer who is highly competent in creating "Sustainable Buildings" David Shad on one of his talk, "the best way to create energy is not to use it", it is indeed of much help in the chase for sustainable energy if there will be an efficient use of energy, we focus too much on the supply side of energy when we can look at the other side of the spectrum where there is an unparalleled opportunity for energy savings, that is why Energy Efficiency has become a field that drawn significant attention in developed countries such as countries in the European Union even in the early years.

On the other hand, ranging from 20% to 40% of the world's energy consumption is contributed by buildings (residential and commercial) [1]. That is why Energy Efficiency in Buildings (EEB) has a very big potential for energy savings.

Energy modeling will play a great role or somewhat can be called the "backbone" of EEB, it is used in buildings mainly for two reasons: modeling the energy usage of the building in the design stage for design optimization (forward modeling) and modeling the energy consumption of an existing building to establish a baseline data to be able to calculate energy savings if retrofits are applied (data-driven modeling) [2].

Data-driven modeling is done in this case study using EnergyPlus software which is a whole building energy simulation program commonly used by engineers, architects, and researchers to model both energy consumption (heating, cooling, ventilation, lighting , and plug and process loads) and water use in buildings [3].

II. LITERATURE BACKGROUND

A. *Software Used*

[4] (Rallapalli, 2010) - There are two commonly used software in energy modeling: EnergyPlus and DOE-2.

DOE-2 is one of the most popular programs used by energy modelers, it has a powerful graphic user interface running the DOE-2 engine which is the eQUEST.

But the Department of Energy of the United States developed a simulation program which has more and new modeling features than the DOE-2, it can do an intricate modeling of a building and depending on the design of the building, it can run a little bit slower than the DOE-2.

It is evident in his study that eQUEST is more easy to use and delivers quick results that according to him will especially help in the decision-making in the design stage of the building. On the other hand, EnergyPlus greatly helps in modeling complex systems more accurately but it is more time consuming.

Therefore it is really upon on the choice or the complexity of the building design that will dictate to the "energy modeler" on what program to be used.

EnergyPlus is then used in the modelling of LB365 since this is a data-driven modelling where it is more likely to have a program that would support many inputs for the system.

B. *Energy Modeling Parameters for EnergyPlus*

[4] (Rallapalli, 2010) – In his study these are the necessary parameters fed to the EnergyPlus software to have realistic results:

Building Site Information and Weather Data – building location, the weather file appropriate for the location, its orientation, and the nearby structures or landscapes that will cause any shading effect.

Building Shell, Structure, Materials, and Shades – the materials and dimensions used for the floors, walls, roof, including glass properties of windows and dimensions of windows. For these surfaces can store or transfer heat.

Building Operations and Scheduling

Information about the occupancy of the building, the time that the building is occupied and when does it end, thermostat set points, HVAC and internal load schedule of operations information.

Internal Loads

Heat gain due to internal loads (people, lighting, and equipment), internal loads constitute to the energy consumption of the building for it can directly or indirectly affect the cooling and heating requirement of the building.

HVAC Equipment and Performance

Information about HVAC equipment (efficiency, air flow rate, etc.) will be very important to the accuracy of the simulation results.

HVAC Zoning

HVAC thermal zoning seeks to group together the rooms in a building that share similar load and usage characteristics.

VI. REFERENCES

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